Agenda Item 9
PowerPoint Presentation

California's Water Supplies and Uses

Presented to
Delta Stewardship Council

Presented by
Joe Grindstaff

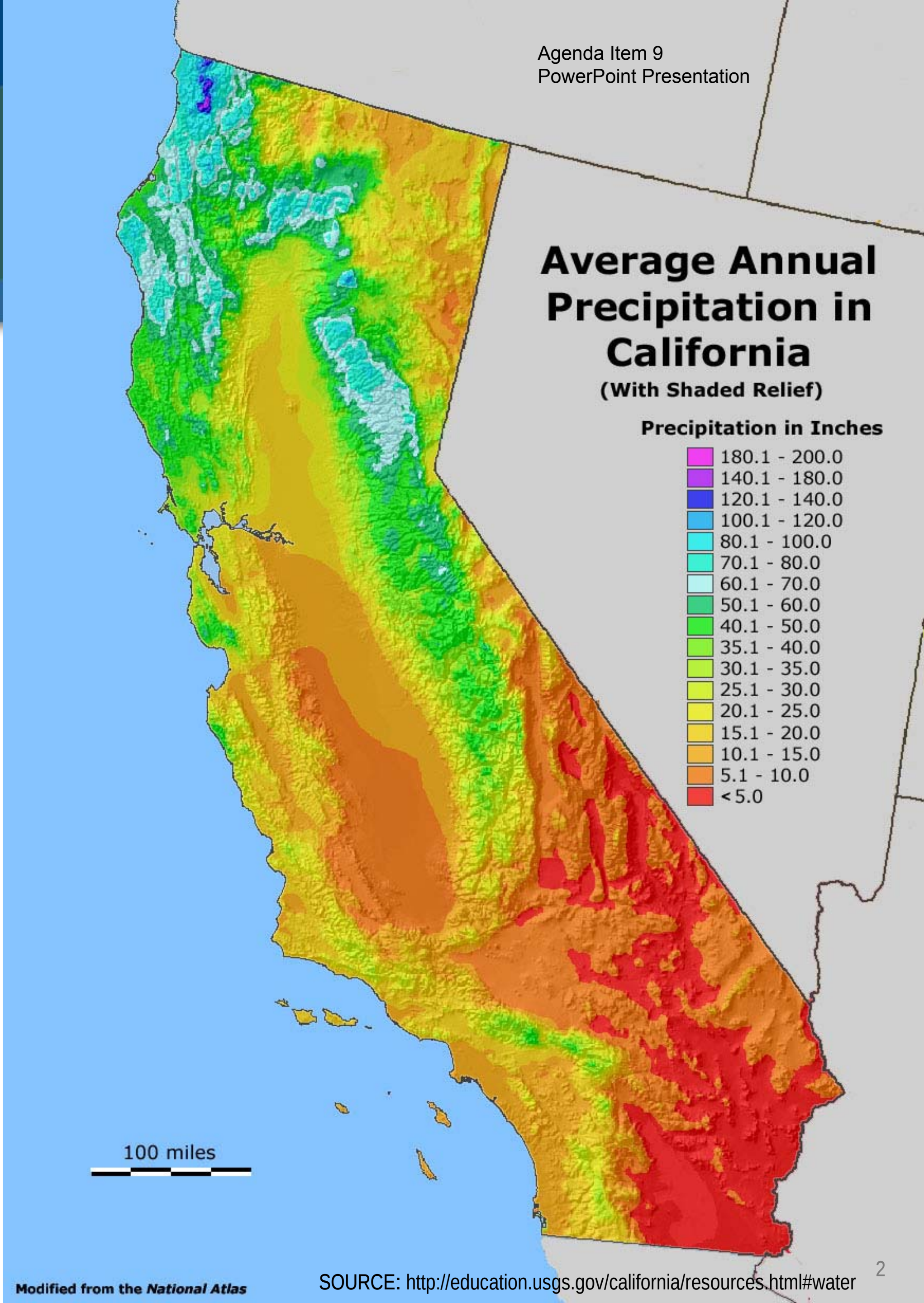
Delta Stewardship Council

September 2010

Place to Place: Most precipitation falls in the mountains in the north and east

- From 1998 to 2005, precipitation runoff varied from 72% to 171% of "average"

SOURCE: *2009 California Water Plan Update*

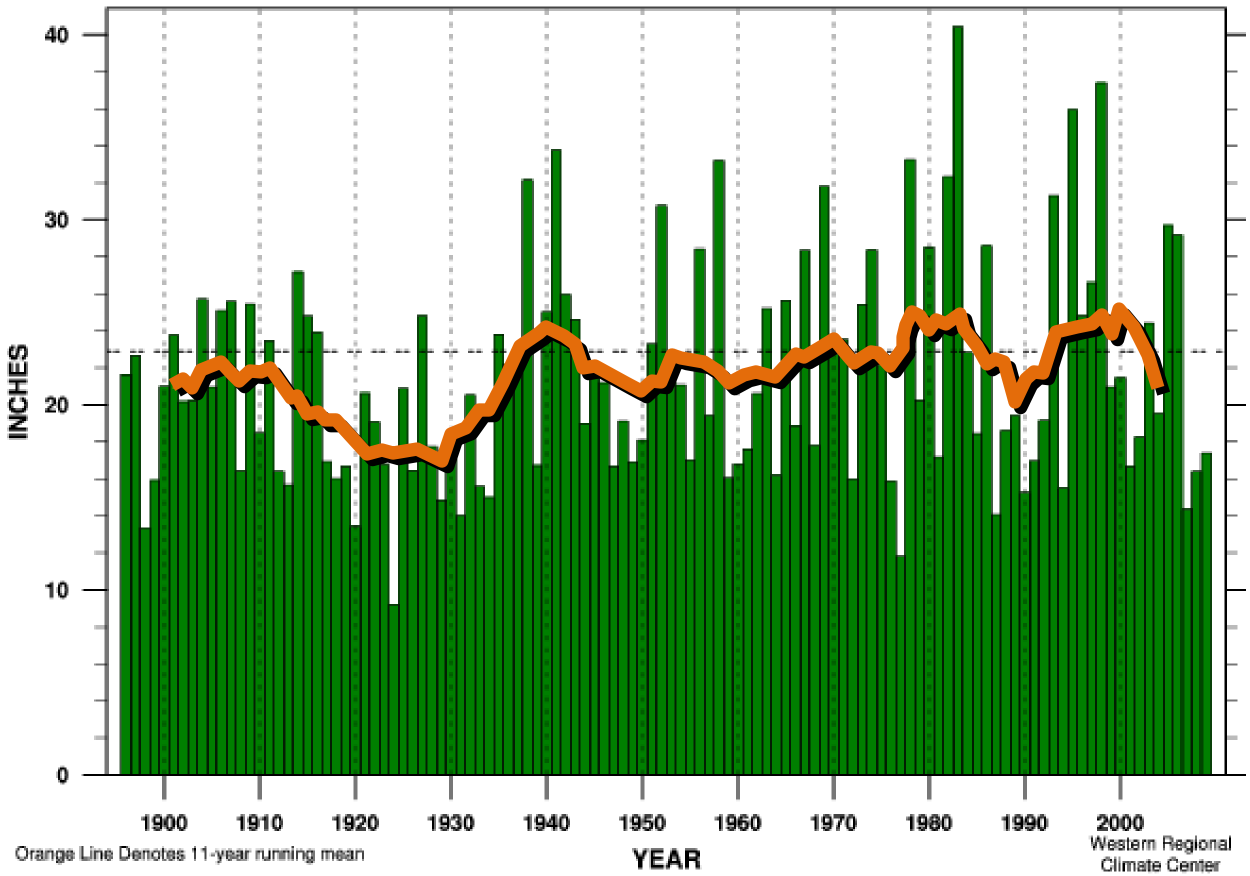


SOURCE: http://education.usgs.gov/california/resources.html#water

Variability in precipitation

- Precipitation varies from year to year
- Supply over 11 year running mean (orange line) remains relatively constant

California Statewide Precipitation (Oct-Sep.)

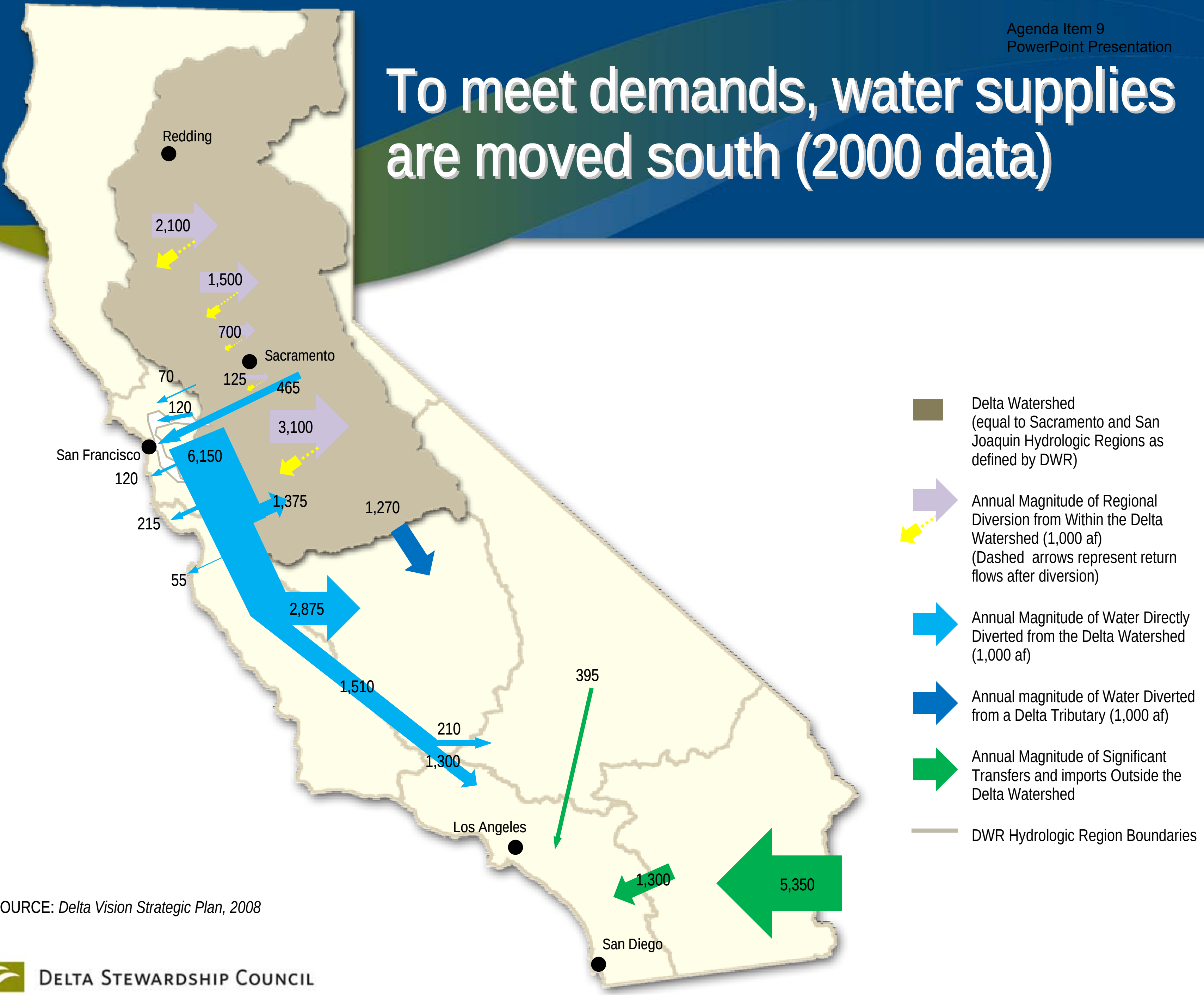


Federal, State, and local water projects work together to balance supplies and demands

- The system of reservoirs and canals were built over the last century to store and move the water to users

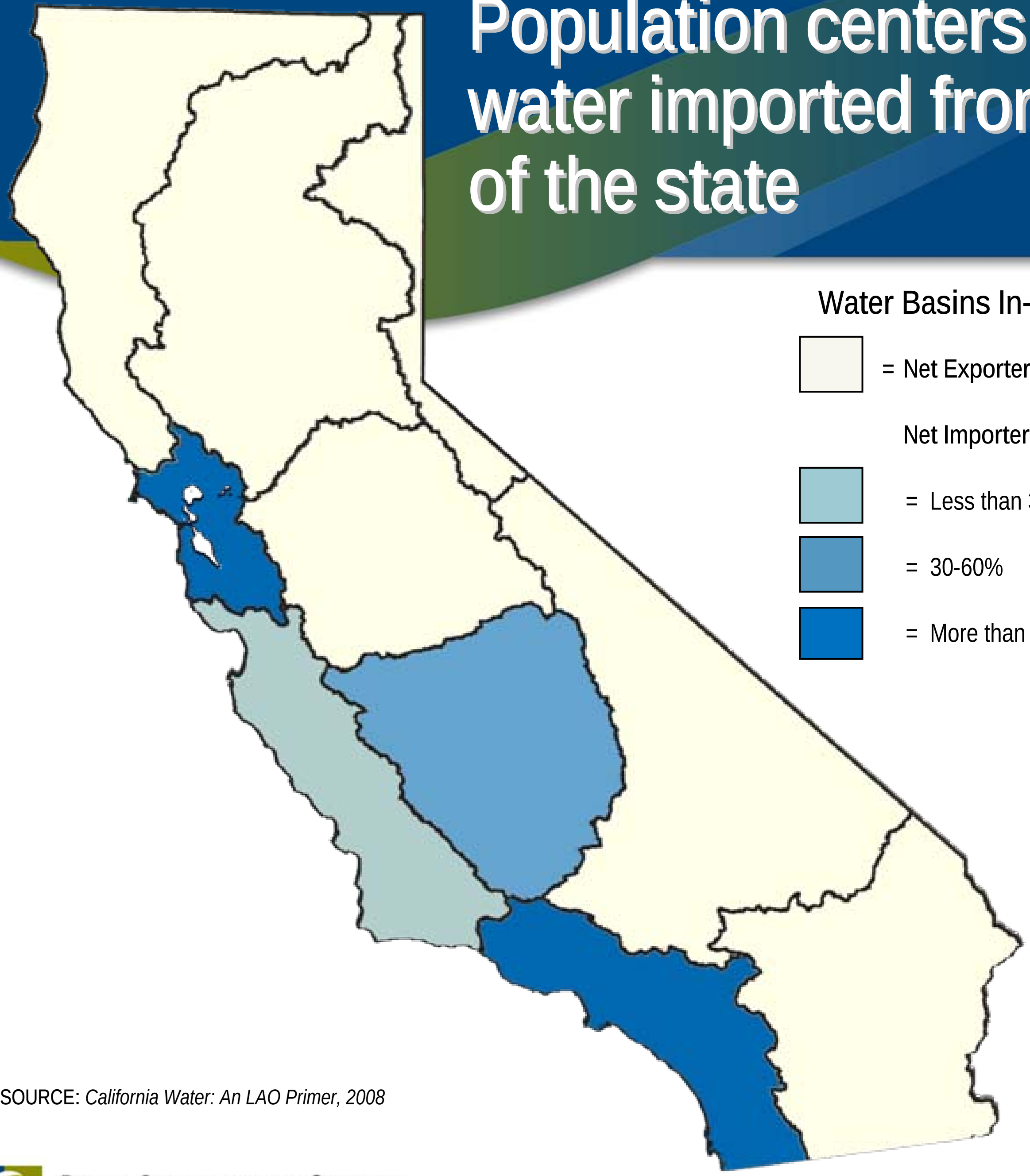
SOURCE: *2009 California Water Plan Update*

To meet demands, water supplies are moved south (2000 data)



SOURCE: *Delta Vision Strategic Plan, 2008*

Population centers rely heavily on water imported from other regions of the state



Water Basins In-State Flow of Water for Use

= Net Exporters*

Net Importers (Percent of Urban and Agricultural Use met by Imports)

= Less than 30%

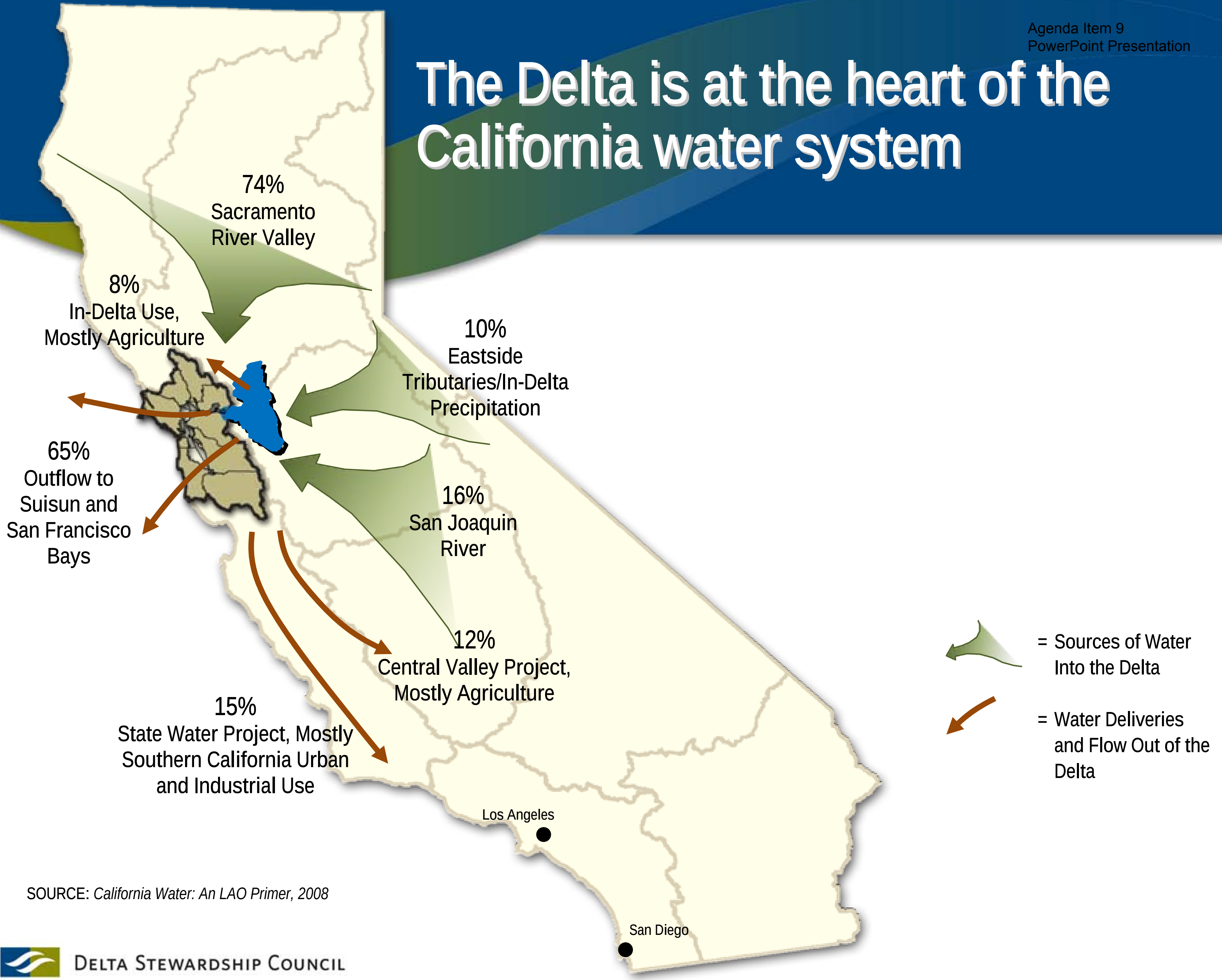
= 30-60%

= More than 60%

* While the Colorado River is a net exporter of water within California, its main source of water is imported from the Upper Colorado Basin

SOURCE: *California Water: An LAO Primer, 2008*

The Delta is at the heart of the California water system



SOURCE: *California Water: An LAO Primer, 2008*

Environmental Water Use (2005)

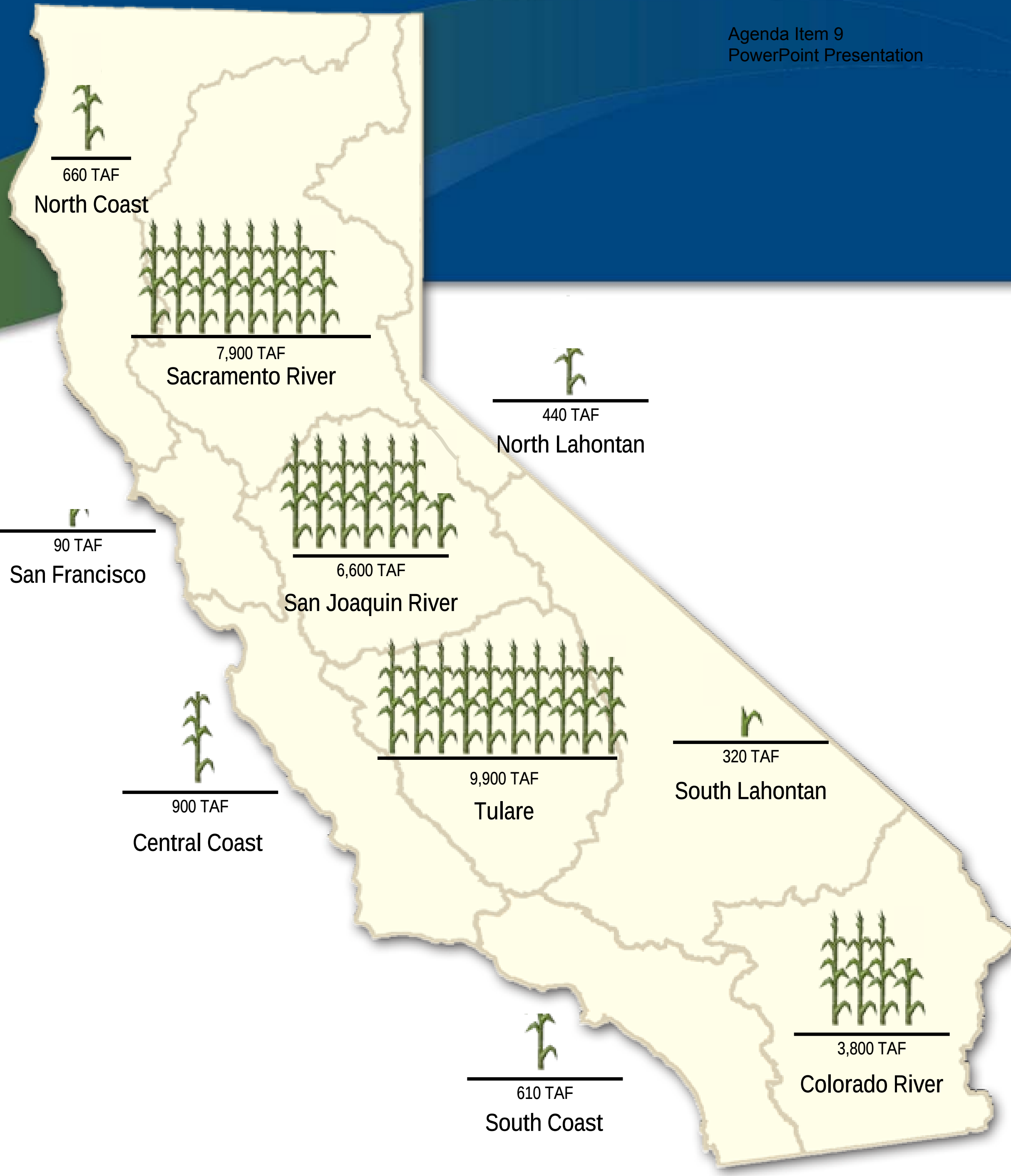
LEGEND:

Million Acre Feet (1,000 TAF)

Hydrologic Region

SOURCE: *2009 California Water Plan Update*

Agricultural Water Use (2005)



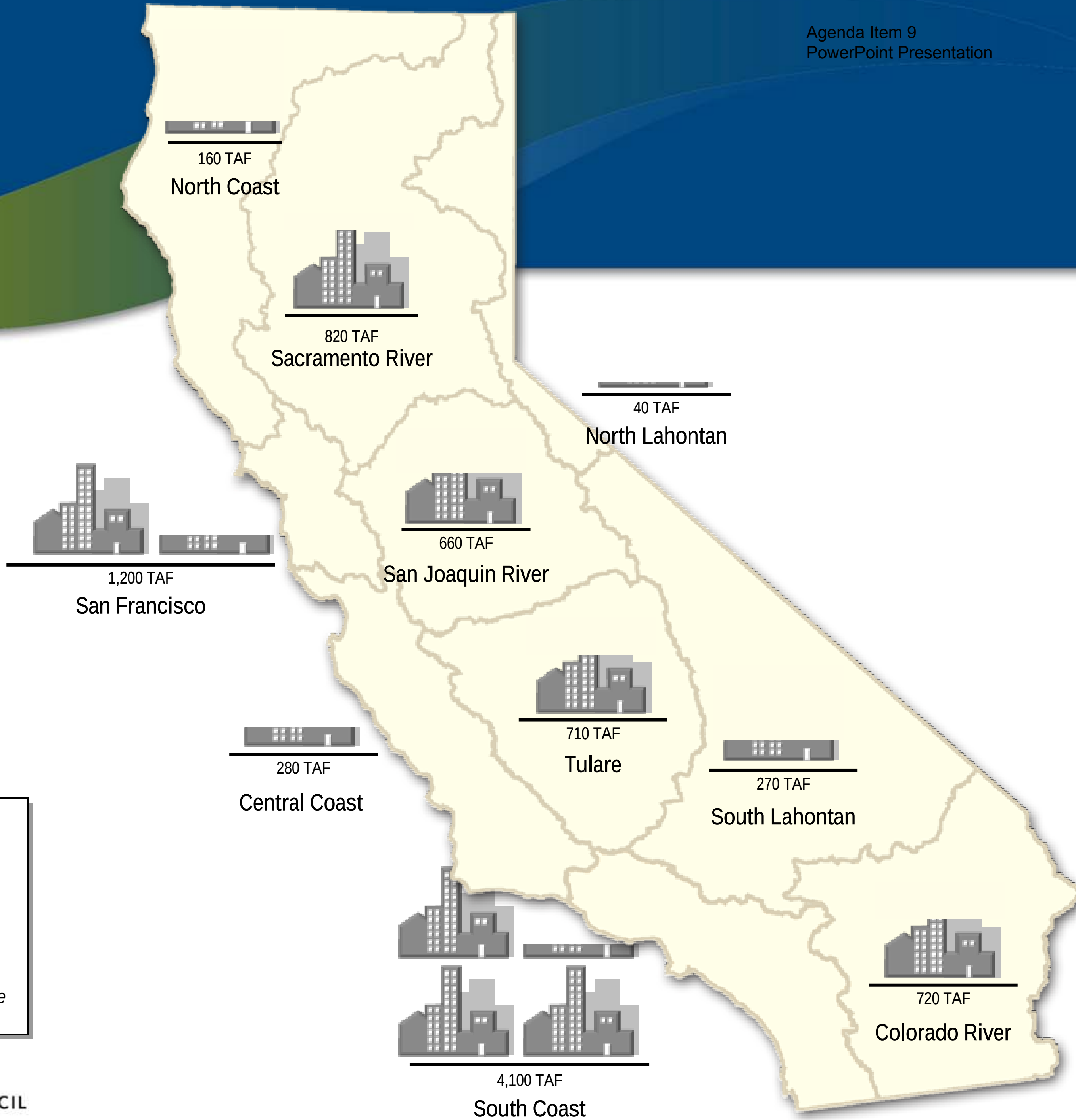
LEGEND:

Million Acre Feet (1,000 TAF)

Hydrologic Region

SOURCE: *2009 California Water Plan Update*

Urban Water Use (2005)



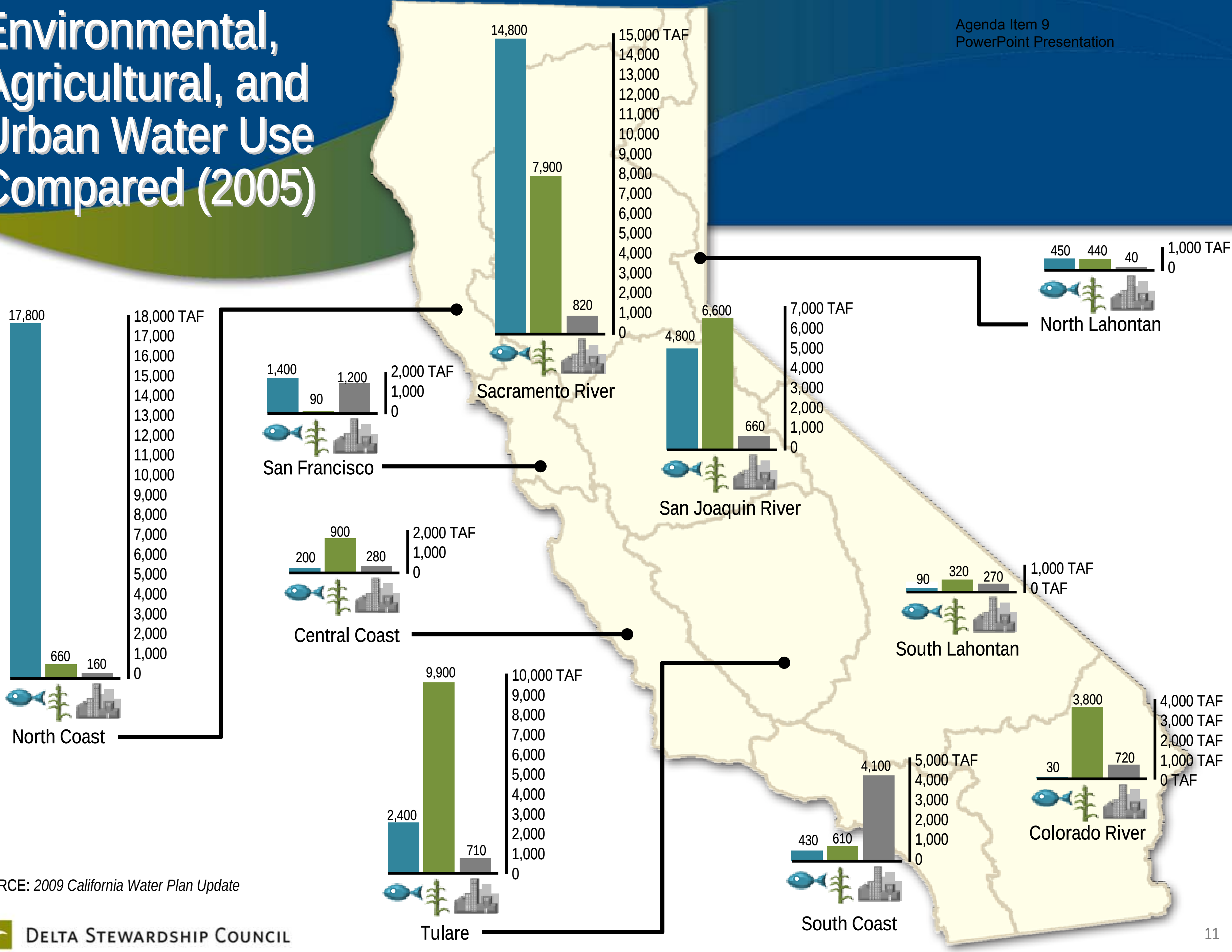
LEGEND:

Million Acre Feet (1,000 TAF)

Hydrologic Region

SOURCE: *2009 California Water Plan Update*

Environmental, Agricultural, and Urban Water Use Compared (2005)



SOURCE: *2009 California Water Plan Update*

Agenda Item 9
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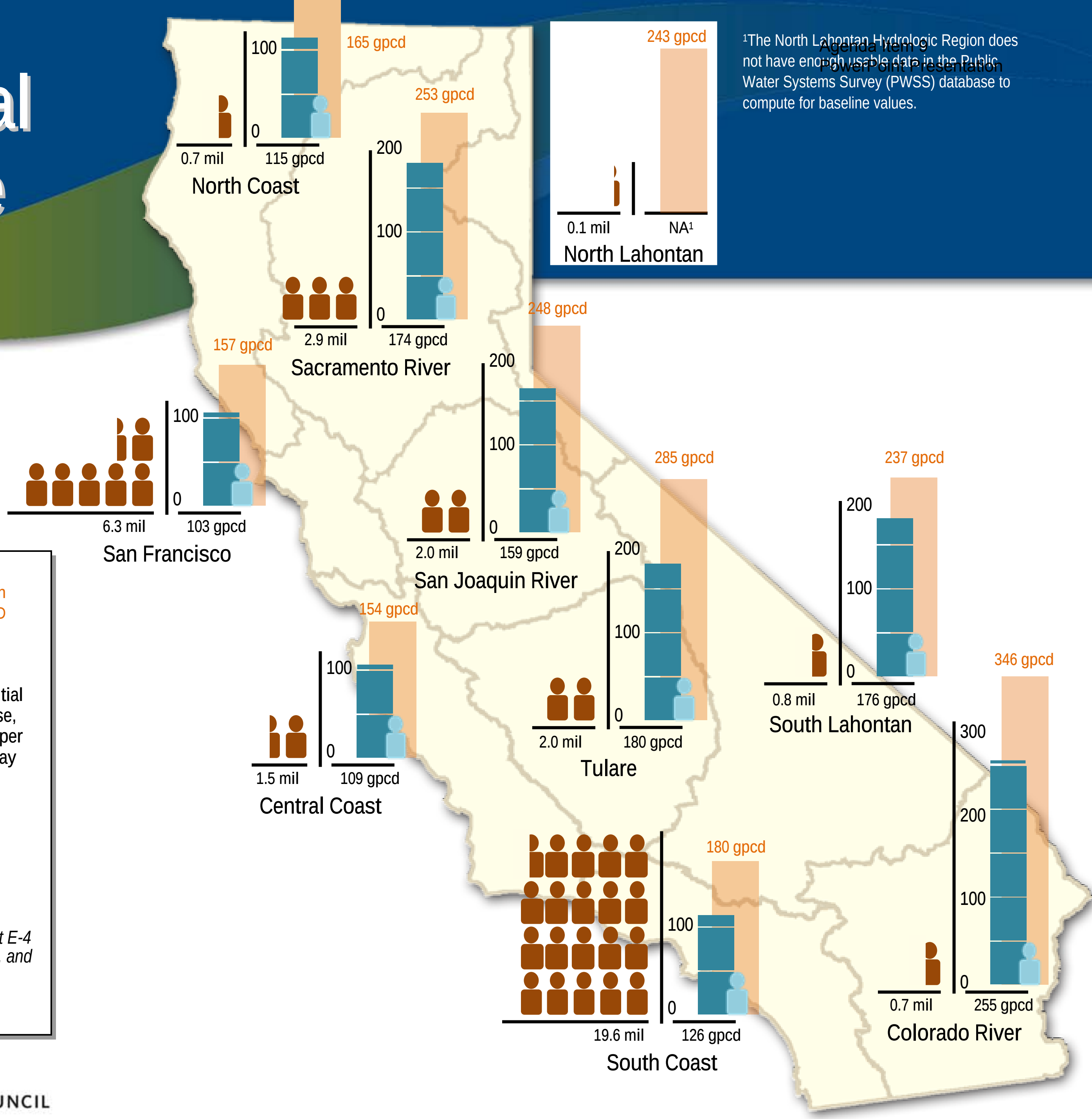
Residential Water Use

[1]The North Lahontan Hydrologic Region does not have enough usable data in the Public Water Systems Survey (PWSS) database to compute for baseline values.



LEGEND:

Total Urban GPCD

Residential water use, gallons per capita day (gpcd)

Population, millions

300
200
100
0

Hydrologic Region

SOURCES:

CA Department of Finance, 2006., *Report E-4 Population Estimates for Cities, Counties, and State, 2001-2005, with DRU Benchmark*

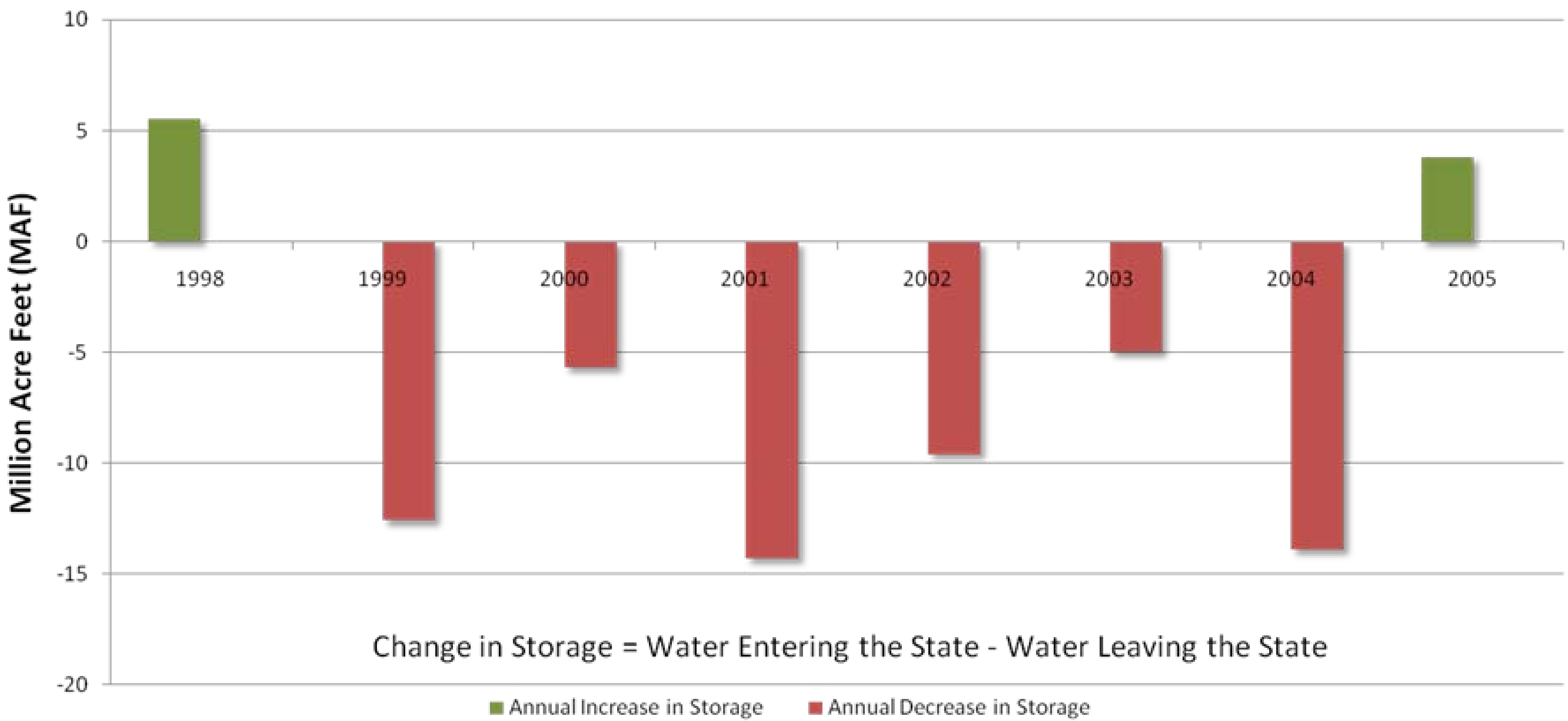
20x2020 Agency Team, *20x2020 Water Conservation Plan 2009*

Urban/agricultural water use increases and available water for environmental use decreases in drier years

All values in million acre-feet	1998 (171% of normal)	2000 (97% of normal)	2001 (72% of normal)
Total supply (precipitation and imports)	336.9	194.7	145.5
Total uses, outflows, & evaporation	331.5	200.4	159.9
Net storage changes in state	5.5	-5.7	-14.3
Distribution of dedicated supply (includes reuse) to various applied water uses			
Urban uses	7.8 (8%)	8.9 (11%)	8.6 (13%)
Agricultural uses	27.3 (29%)	34.2 (41%)	33.7 (52%)
Environmental water (required instream flows, Delta outflow, and managed wetlands)	59.4 (63%)	39.4 (48%)	22.5 (35%)
Total dedicated supply	94.5	82.5	64.8

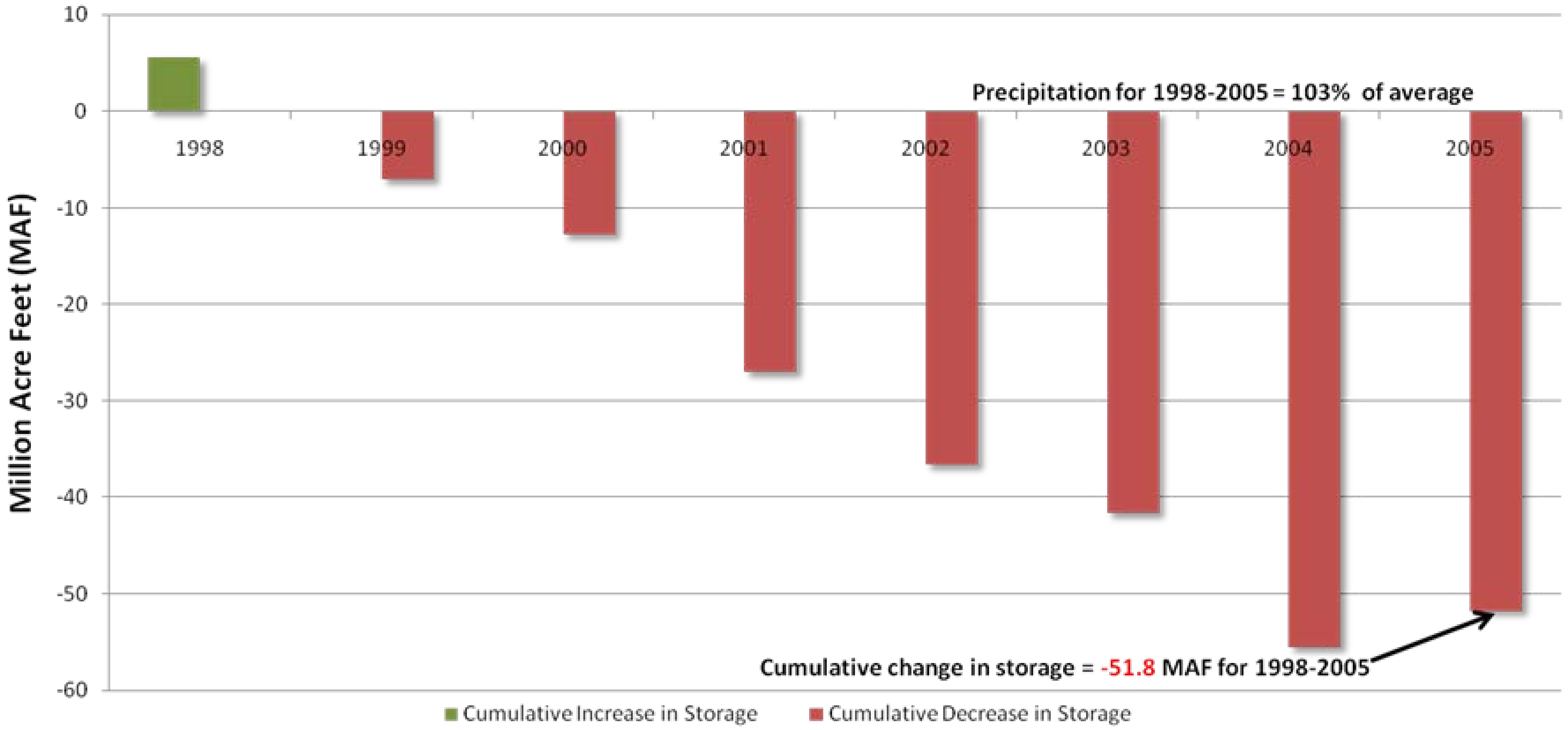
SOURCE: *2005 California Water Plan Update*

Annual Statewide Changes in Storage (1998-2005)



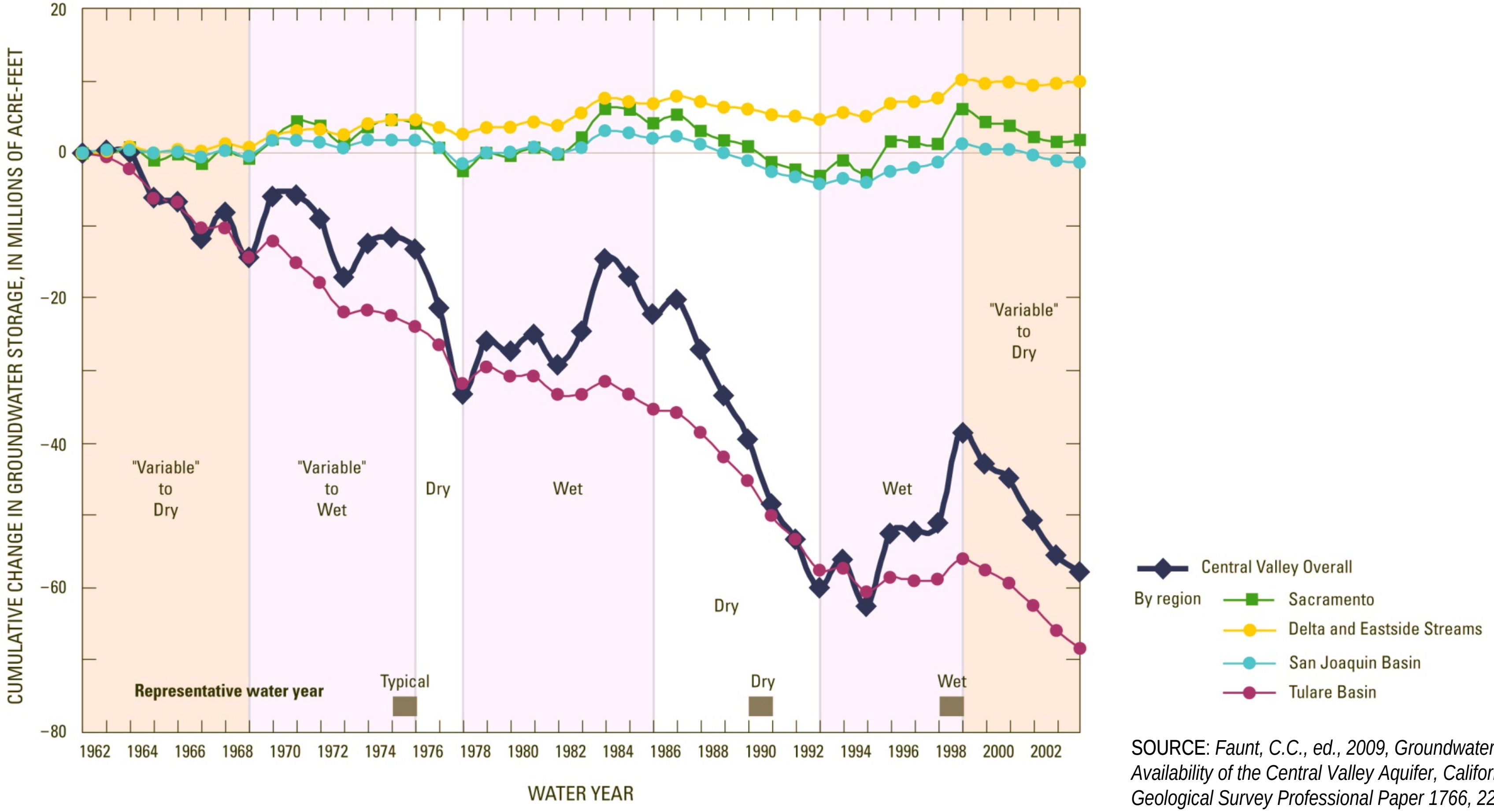
SOURCE: *2009 California Water Plan Update*

Cumulative Statewide Change in Storage (1998-2005)



SOURCE: *2009 California Water Plan Update*

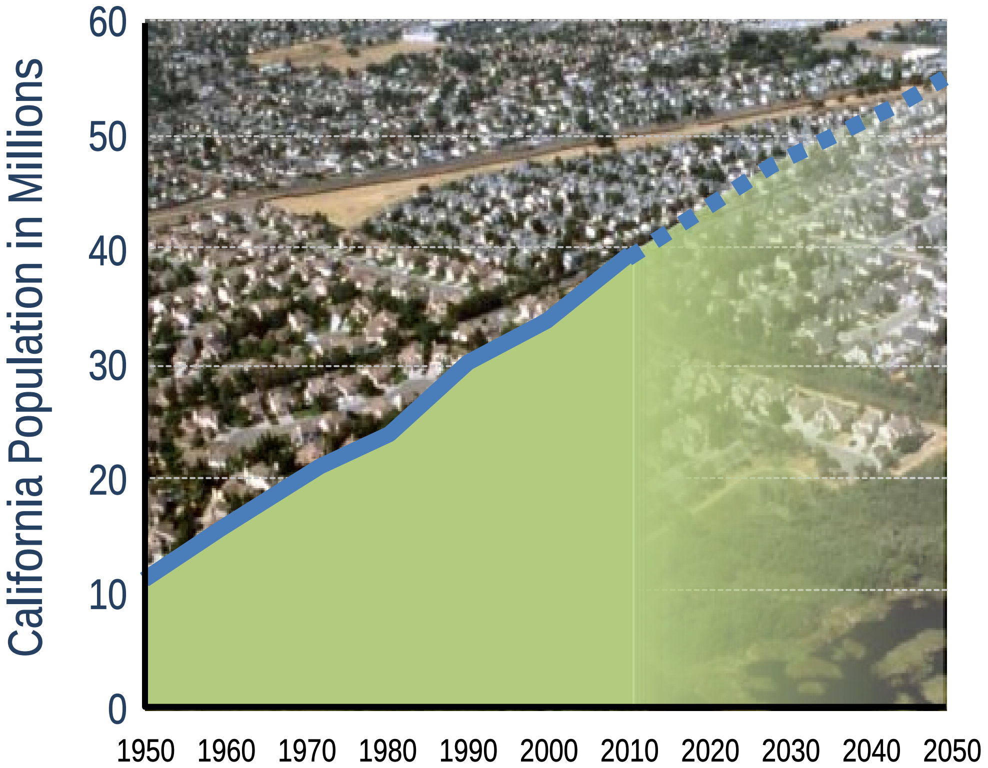
Cumulative change in Central Valley groundwater storage (1962-2003)



SOURCE: *Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p.*

Balancing water supplies and uses from year to year is becoming more challenging

- Since 1960, the State population has more than doubled
- Increase of 4,400,000 people from 2000 to 2009
- Further anticipated growth will create more demand; droughts more difficult to manage

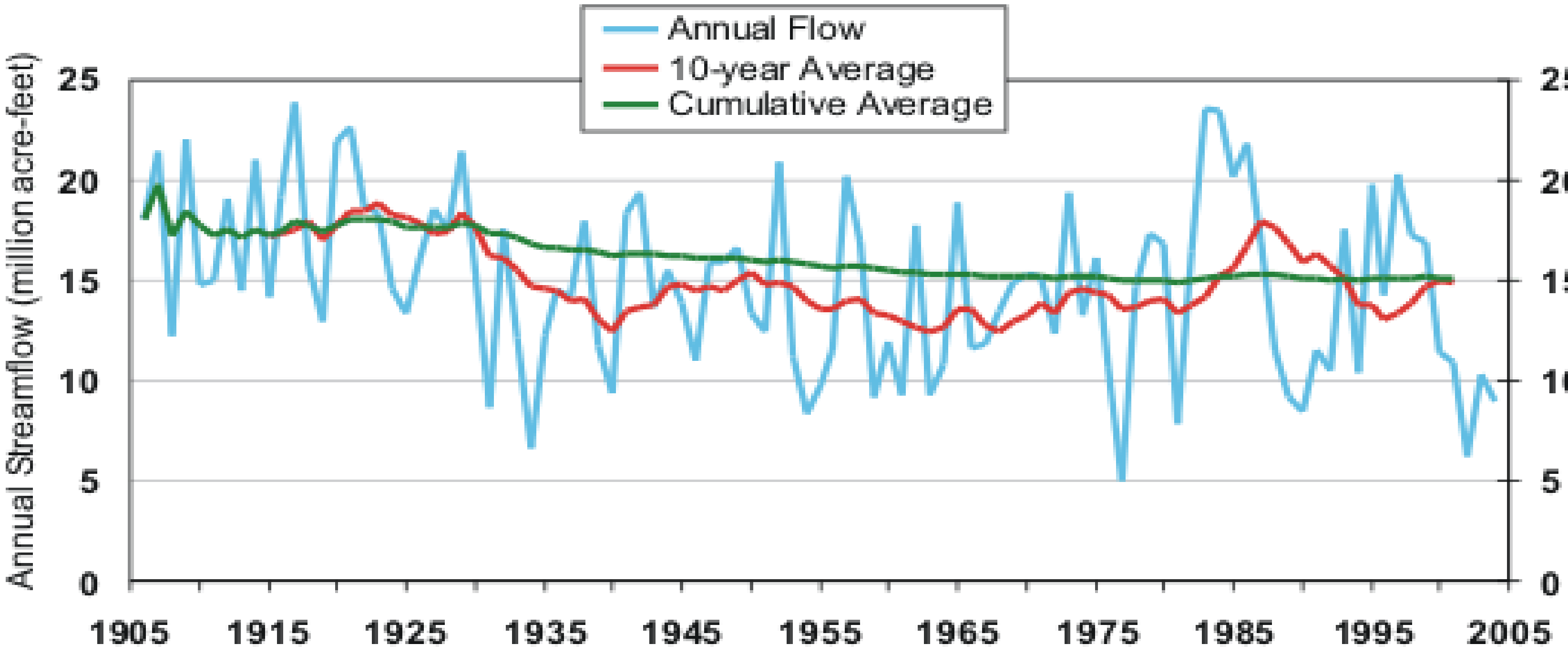


SOURCE: *CA Department of Finance, 2010*

Balancing water supplies and uses from year to year is becoming more challenging

- Irrigated agriculture shifting to permanent crops in some areas, changing irrigation demand patterns
- Water conveyance through the Delta restricted due to environmental concerns
- Climate change predicted to change precipitation patterns, decreasing snowpack and increasing flood risks

Colorado River Flows



The graph above shows the natural flow record for the Colorado River at Lees Ferry, from 1906-2004. The annual flows are shown in blue, a running 10-year average in red, and a cumulative average in green. Keeping in mind that the total allocation of water at Lees Ferry is 16.5 million acre-feet (MAF) per year, and actual depletions (use plus evaporation) are now about 14 MAF annually, several features of the natural flow record are worth noting:

- The annual flows over the past century have varied by a factor of five, from about 5 MAF (1977) to 25 MAF (1984)
- The period from 1906-1930 had 10-year average flows higher than any other part of the record except the mid-1980s
- The cumulative average annual flow declined from about 17 MAF (averaged from 1906-1930) to about 15 MAF (averaged from 1906-2004)
- The 10-year running average has varied from about 12.4 MAF to 18 MAF--in other words, the decadal-scale variability has been high
- From 1934 to 1984, the 10-year running average was almost always below 15 MAF
- The 2000-2004 drought was the most severe multi-year drought in the record, with an average annual flow of 9.6 MAF over those five years

Western Water Assessment
http://wwa.colorado.edu/treeflow/lees/gage.html

Predictions are for more decreases in runoff

TABLE 5-1. Projected Changes in Colorado River Basin Runoff or Streamflow in the Mid-21st Century from Recent Studies

Study	*GCMs (runs)*	*Spatial Scale*	*Temperature*	*Precipitation*	*Year*	*Runoff (Flow)*	*Risk Estimate*
Christensen et al. 2004	1 (3)	VIC model grid (~8 mi)	+3.1°F	-6%	2040–69	-18%	Yes
Milly 2005, replotted by P.C.D. Milly	12 (24) (~100–300 mi)	GCM grids —	—		2041–60	-10 to -20% 96% model agreement	No
Hoerling and Eischeid 2006	18 (42)	NCDC Climate Division	+5.0°F	~0%	2035–60	-45%	No
Christensen and Lettenmaier 2007	11 (22)	VIC model grid (~8 mi)	+4.5°F (+1.8 to +5.0)	-1% (-21% to +13%)	2040–69	-6% (-40% to +18%)	Yes
Seager et al. 2007*	19 (49)	GCM grids (~100–300 mi)	—	—	2050	-16% (-8% to -25%)	No
McCabe and Wolock 2008	—	USGS HUC8 units (~25–65 mi)	Assumed +3.6°F	0%	—	-17 %	Yes
Barnett and Pierce 2008*	—	—	—	—	2057	Assumed -10% to -30%	Yes

Values and ranges (where available) were extracted from the text and figures of the references shown. Columns provide the number of climate models and individual model runs used to drive the hydrology models, the spatial scale of the hydrology, the temperature and precipitation changes that drive the runoff projections, and whether or not the study quantified the risk these changes pose to water supply (e.g., the risk of a compact call or of significantly depleting reservoir storage).

* Two studies do not specifically make projections of Upper Basin runoff or streamflow. Seager et al. (2007) average over a large area (95°W–125°W, 25°N–40°N) that only partially overlaps with the Upper Basin. Barnett and Pierce (2008) assume Lees Ferry streamflow changes to drive their water balance model of reservoir storage.

SOURCE: *Colorado Water Conservation Board (CWCB) report " Colorado Climate Change: A Synthesis to Support Water Resource Management and Adaptation." Oct 2008 (available online at: http://cwcb.state.co.us/NR/rdonlyres/8118BBDB-4E54-4189-A354-3885EEF778A8/0/CCSection5.pdf)*

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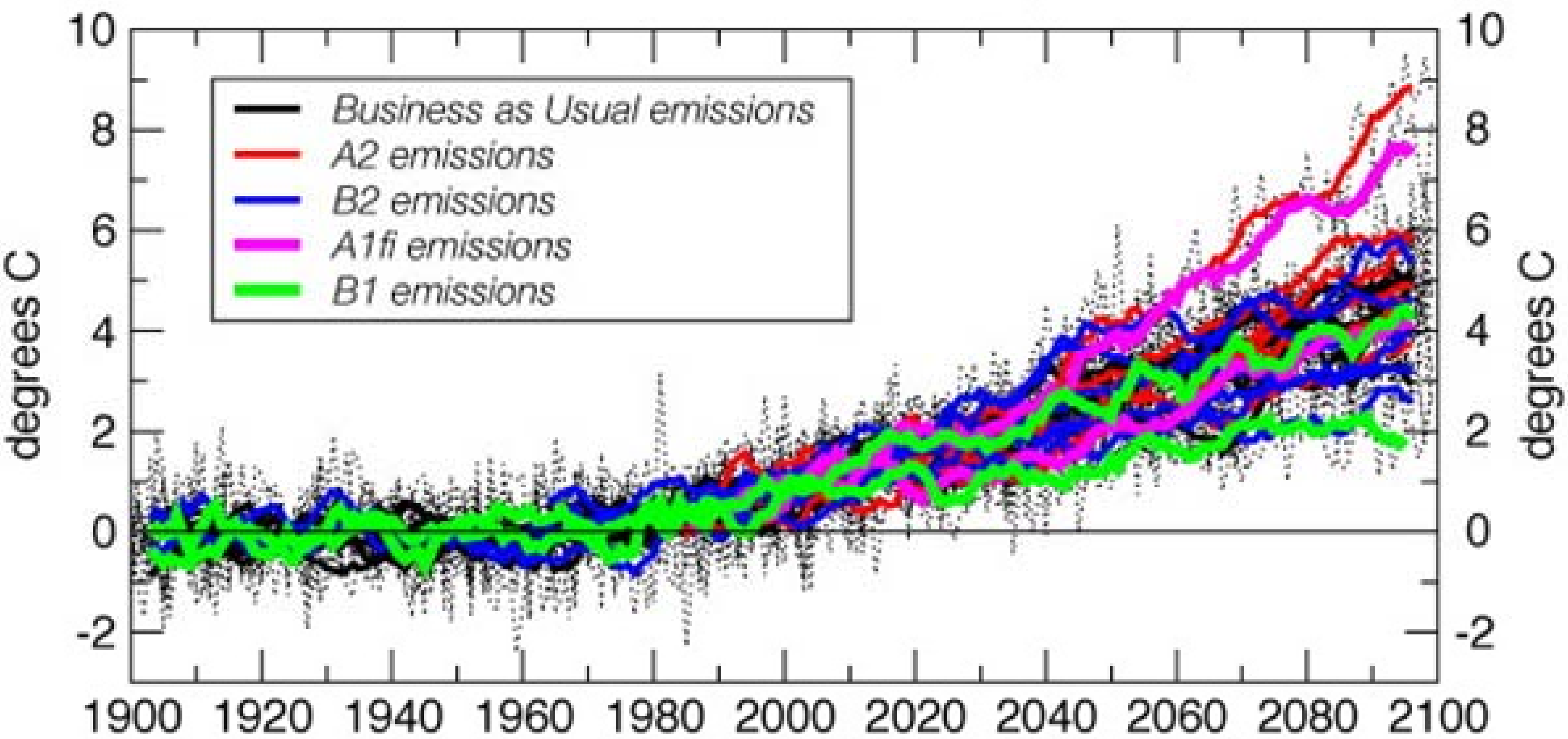
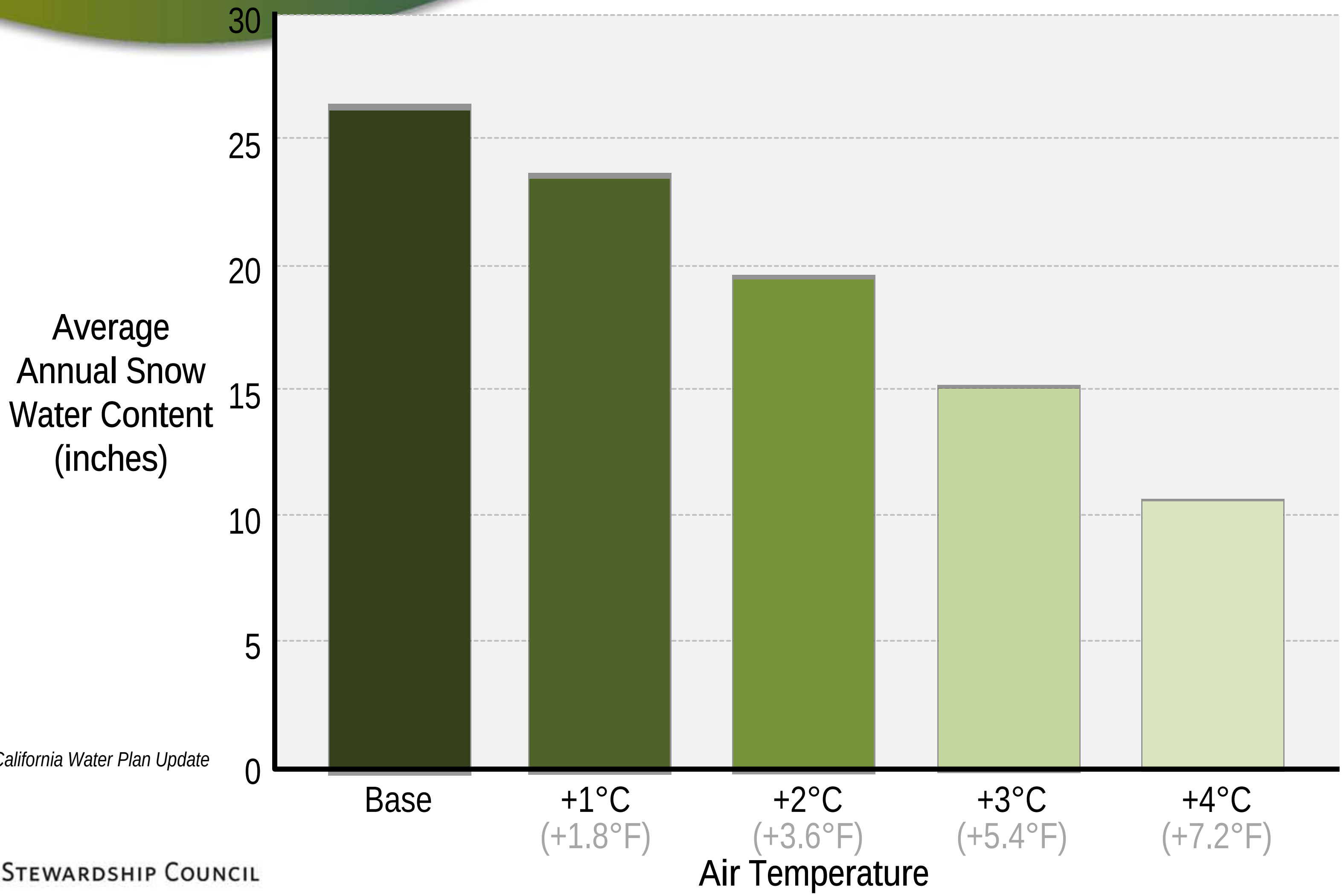
Projected changes in annual temperature, northern California



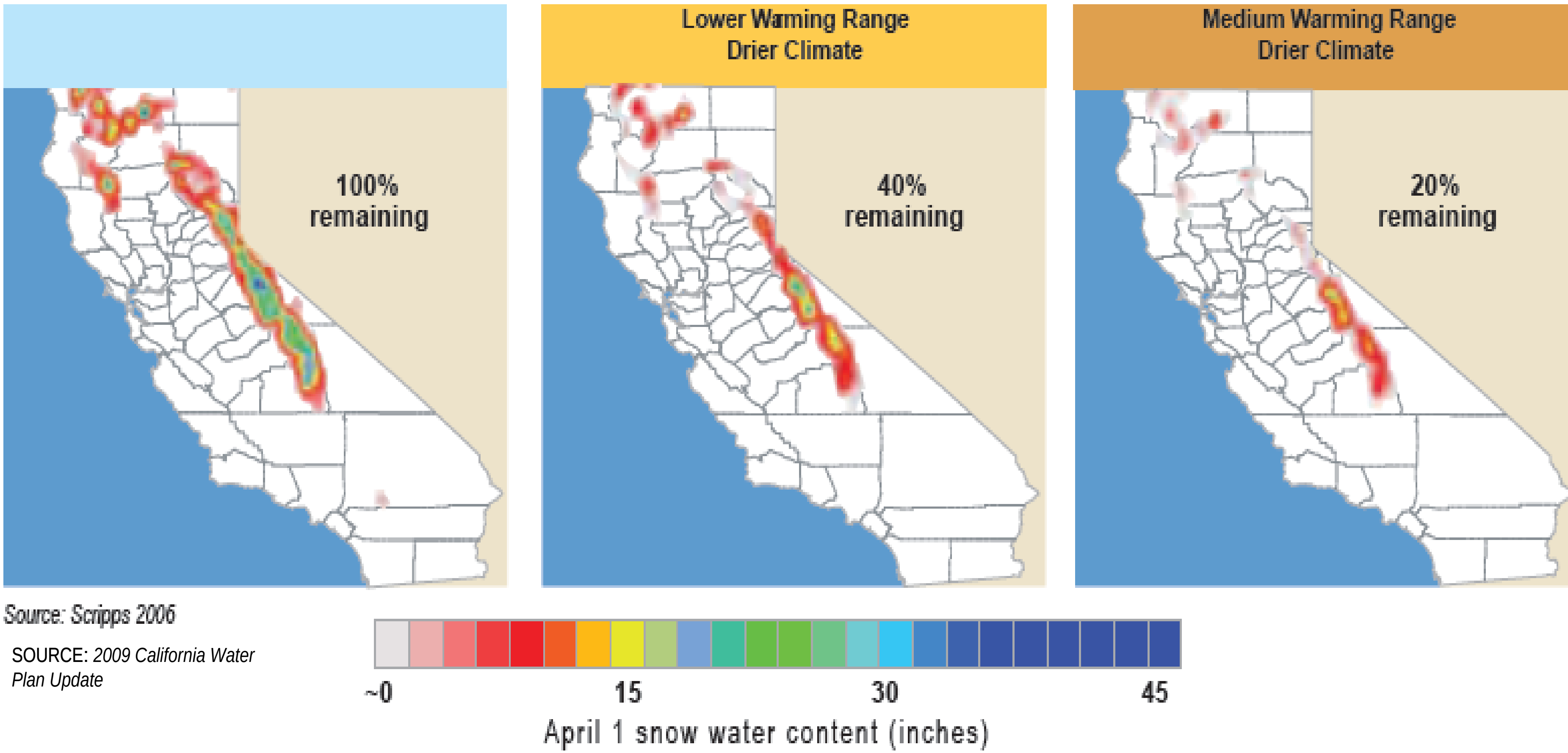
SOURCE: California Department of Water Resources, 2007. *Climate Change Research Needs Workshop*

Average annual snowmelt for Upper Feather River Basin decreases with temperature increases



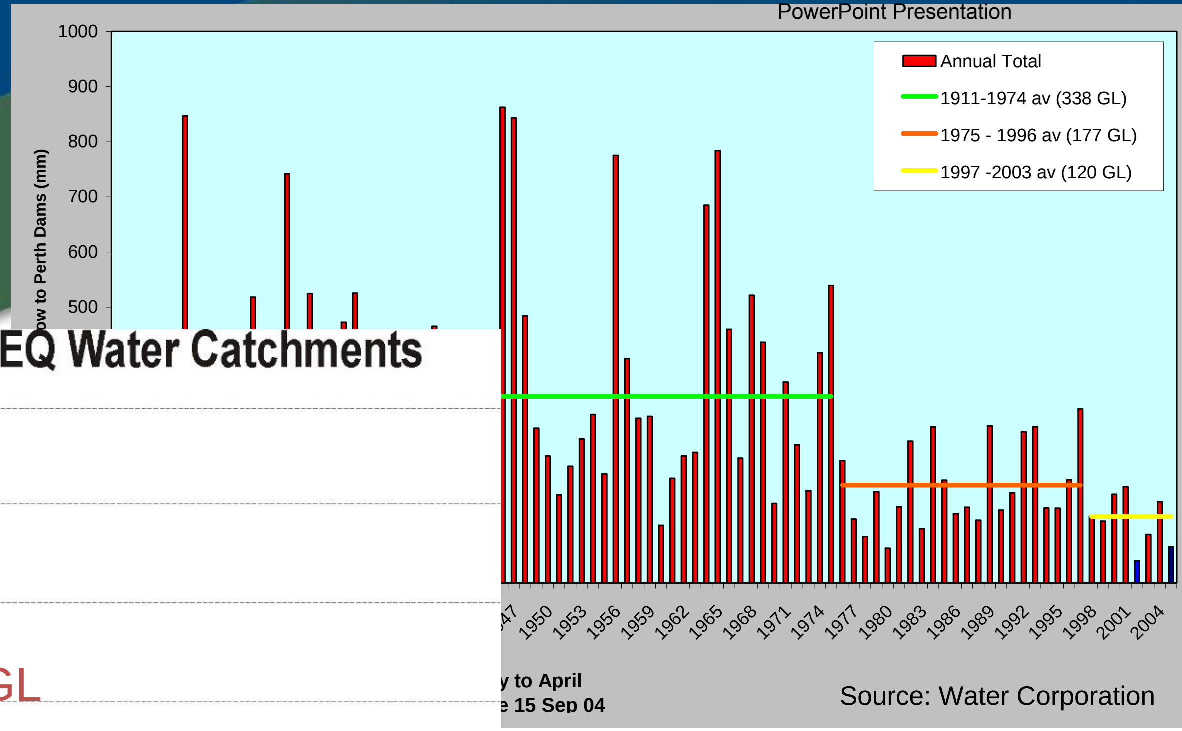
SOURCE: *2009 California Water Plan Update*

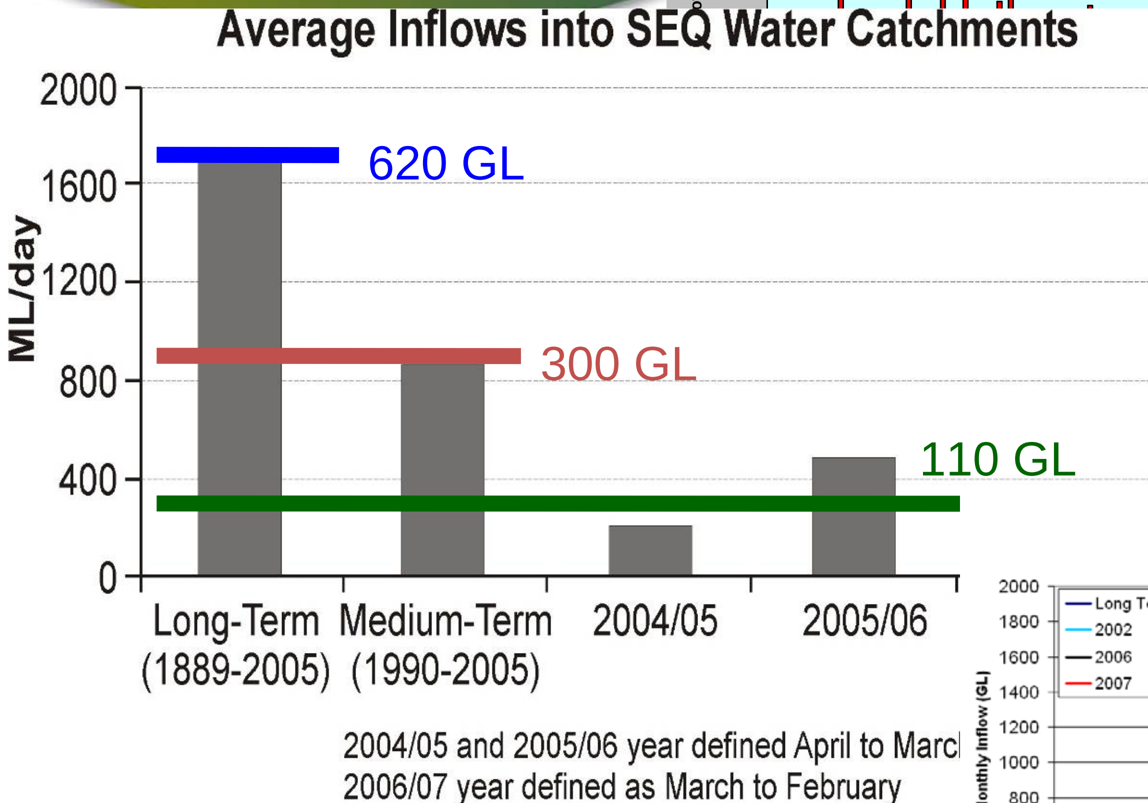
Historical and projected decreasing California snowpack

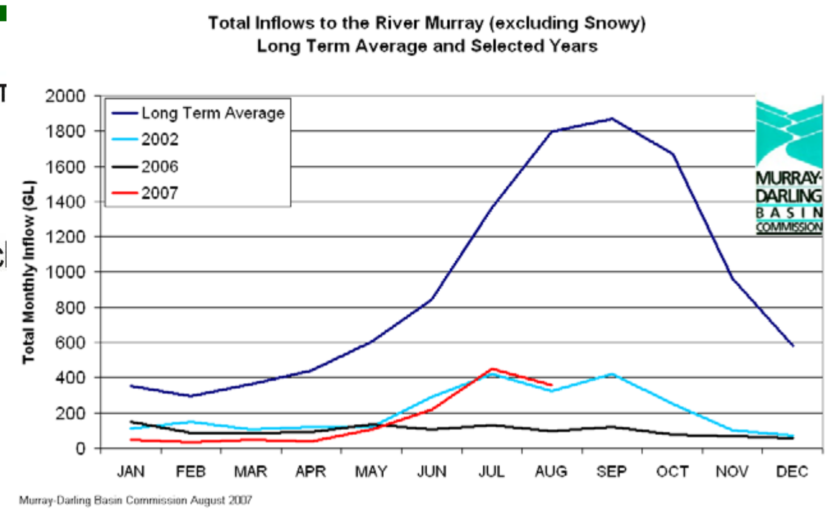


SOURCE: *2009 California Water Plan Update*

Australia's experience with declining flows







SOURCE:
David Downie
General Manager, Office of Water
State Government of Victoria, Australia

Australia Lessons Learned

1. Wide community involvement
2. Lowest cost water is existing water supply
3. Environmental sustainability
4. Climate change can happen faster than you expect
5. Federal / State / local co-operation
6. Pricing
7. Institutional structures are critical

Conclusions

- Delta has a key place in California's water picture
- Change is coming, perhaps faster than we think
- Tough decisions are being made that will lead to different futures

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